

# Burak Tekdamar

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## CSE 344 HW3 REPORT

### 1 Overview

First of all, I created a total of 7 child processes for 6 chefs and 1 pusher. I provided the management of the wholesaler in the parent process. The wholesaler reads 3 bytes from the file each time. 2 of them represent ingredients and 1 represents the new line. The first two characters read are written to the shared array and sent to the pusher. The pusher reads the array and sends it to the necessary chef. These processes are operated synchronously with the help of semaphores.

### 2 How did I solve this

#### Unnamed Semaphores

First of all, I created a struct named SharedBlock for semaphores and shared array. In this struct, there are 6 separate semaphores for the chef, one for the pusher, and one for the wholesaler. I provide synchronization between wholesaler and chefs through the semaphores here. I created a separate struct named Chef within the chefs' information. In this struct, there are 2 variables for the ingredient values that the chef needs, an id variable that gives the chef's number, a variable holding the pid of the process where the chef was created, a pointer to hold the semaphore of the chef, and a variable for the total number of desserts created by the chef.

```
20
21 typedef struct {
22     sem_t semGullac,
23     semWS,
24     semFW,
25     semSF,
26     semMF,
27     semMW,
28     semSM;
29     sem_t semOrganizer;
30     int dessertNum;
31     int controlFlag;
32     char sharedArr[2];
33 } SharedBlock;
```

*SharedBlock struct*

```
35 typedef struct {
36     enum Ing ing1;
37     enum Ing ing2;
38     int id;
39     int chefDessert;
40     pid_t pid;
41     sem_t *semChef;
42 } Chef;
```

*Chef struct*

Chefs are created in a loop in a function, and each chef is sent to a process with a fork. I kept a variable called controlFlag in the shared block so that wholesaler and pusher are run only once. This variable takes the value TRUE when the wholesaler runs, so that the wholesaler is run once. wholesaler writes the 2 bytes it reads from the file to the array and posts the pusher's semaphore. The pusher starts to work and posts the values in the array to the semaphore of the chef that needs it. The chef increases the number of desserts he makes by buying the ingredients he needs. When there is no value left to read in the file, the wholesaler writes the NN value to the array and sends it to the pusher. pusher sends the value in the array to all chefs to finalize the chefs and get the number of desserts they have produced. The wholesaller waits for the end of all chefs with waitpid before the program ends and collects the return values from the chefs to find the total number of desserts produced.

***Running hw3unnamed program:***

```
./hw3unnamed -i inputFilePath
```

## **Named Semaphores**

The whole operation of the program is the same as unnamed. The only difference is that I don't need to use a structure called SharedBlock here. I got a name value as parameter for chefs and wholesaler from user. These values taken represent the names of the semaphores. A different semaphore is created for each chef by adding the chef's id to the end of the name value I get for the chefs. When the program is terminated, all processes free their resources.

***Running hw3named program:***

```
./hw3named -i inputFilePath -n chefsname -w wholesalername
```

I wrote a handler in both programs to catch the SIGINT signal. When the user presses the CTRL+C while the program is running, the program frees all its resources and terminates all open processes.

# OUTPUTS

```
burak@burak-IdeaPad-Gaming-3-15ARH05:~/Desktop/CSE344 Homeworks/HW3$ ./hw3unnamed -i input
chef0 (pid 43413) is waiting for Walnuts and Sugar
chef1 (pid 43414) is waiting for Flour and Walnuts
chef2 (pid 43415) is waiting for Sugar and Flour
chef3 (pid 43416) is waiting for Milk and Flour
chef4 (pid 43417) is waiting for Milk and Walnuts
chef5 (pid 43418) is waiting for Sugar and Milk
the wholesaler (pid 43412) delivers Walnuts and Sugar
the wholesaler (pid 43412) is waiting for the dessert
chef0 (pid 43413) has taken the Walnuts [WS]
chef0 (pid 43413) has taken the Sugar [WS]
chef0 (pid 43413) is preparing the dessert [WS]
chef0 (pid 43413) has delivered the dessert [WS]
chef0 (pid 43413) is waiting for Walnuts and Sugar [WS]
the wholesaler (pid 43412) has obtained the dessert and left
the wholesaler (pid 43412) delivers Flour and Milk
the wholesaler (pid 43412) is waiting for the dessert
chef3 (pid 43416) has taken the Milk [FM]
chef3 (pid 43416) has taken the Flour [FM]
chef3 (pid 43416) is preparing the dessert [FM]
chef3 (pid 43416) has delivered the dessert [FM]
chef3 (pid 43416) is waiting for Milk and Flour [FM]
the wholesaler (pid 43412) has obtained the dessert and left
the wholesaler (pid 43412) delivers Sugar and Milk
the wholesaler (pid 43412) is waiting for the dessert
chef5 (pid 43418) has taken the Sugar [SW]
chef5 (pid 43418) has taken the Milk [SW]
chef5 (pid 43418) is preparing the dessert [SW]
chef5 (pid 43418) has delivered the dessert [SW]
chef5 (pid 43418) is waiting for Sugar and Milk [SW]
the wholesaler (pid 43412) has obtained the dessert and left
the wholesaler (pid 43412) delivers Sugar and Walnuts
the wholesaler (pid 43412) is waiting for the dessert
chef0 (pid 43413) has taken the Walnuts [SW]
chef0 (pid 43413) has taken the Sugar [SW]
chef0 (pid 43413) is preparing the dessert [SW]
chef0 (pid 43413) has delivered the dessert [SW]
chef0 (pid 43413) is waiting for Walnuts and Sugar [SW]
the wholesaler (pid 43412) has obtained the dessert and left
the wholesaler (pid 43412) delivers Milk and Sugar
the wholesaler (pid 43412) is waiting for the dessert
chef5 (pid 43418) has taken the Sugar [MS]
chef5 (pid 43418) has taken the Milk [MS]
chef5 (pid 43418) is preparing the dessert [MS]
chef5 (pid 43418) has delivered the dessert [MS]
chef5 (pid 43418) is waiting for Sugar and Milk [MS]
the wholesaler (pid 43412) has obtained the dessert and left
chef1 (pid 43414) is exiting
chef2 (pid 43415) is exiting
chef0 (pid 43413) is exiting
chef5 (pid 43418) is exiting
chef4 (pid 43417) is exiting
chef3 (pid 43416) is exiting
the wholesaler (pid 43412) is done (total deserts: 5)
```

## hw3unnamed program results

```
burak@burak-IdeaPad-Gaming-3-15ARH05:~/Desktop/CSE344 Homeworks/HW3$ ./hw3named -i input -n chef -w wholesaler
chef0 (pid 43622) is waiting for Walnuts and Sugar
chef1 (pid 43623) is waiting for Flour and Walnuts
chef2 (pid 43624) is waiting for Sugar and Flour
chef3 (pid 43625) is waiting for Milk and Flour
chef4 (pid 43626) is waiting for Milk and Walnuts
chef5 (pid 43627) is waiting for Sugar and Milk
the wholesaler (pid 43621) delivers Walnuts and Sugar
the wholesaler (pid 43621) is waiting for the dessert
chef0 (pid 43622) has taken the Walnuts [WS]
chef0 (pid 43622) has taken the Sugar [WS]
chef0 (pid 43622) is preparing the dessert [WS]
chef0 (pid 43622) has delivered the dessert [WS]
chef0 (pid 43622) is waiting for Walnuts and Sugar [WS]
the wholesaler (pid 43621) has obtained the dessert and left
the wholesaler (pid 43621) delivers Flour and Milk
the wholesaler (pid 43621) is waiting for the dessert
chef3 (pid 43625) has taken the Milk [FM]
chef3 (pid 43625) has taken the Flour [FM]
chef3 (pid 43625) is preparing the dessert [FM]
chef3 (pid 43625) has delivered the dessert [FM]
chef3 (pid 43625) is waiting for Milk and Flour [FM]
the wholesaler (pid 43621) has obtained the dessert and left
the wholesaler (pid 43621) delivers Sugar and Milk
the wholesaler (pid 43621) is waiting for the dessert
chef5 (pid 43627) has taken the Sugar [SW]
chef5 (pid 43627) has taken the Milk [SW]
chef5 (pid 43627) is preparing the dessert [SW]
chef5 (pid 43627) has delivered the dessert [SW]
chef5 (pid 43627) is waiting for Sugar and Milk [SW]
the wholesaler (pid 43621) has obtained the dessert and left
the wholesaler (pid 43621) delivers Sugar and Walnuts
the wholesaler (pid 43621) is waiting for the dessert
chef0 (pid 43622) has taken the Walnuts [SW]
chef0 (pid 43622) has taken the Sugar [SW]
chef0 (pid 43622) is preparing the dessert [SW]
chef0 (pid 43622) has delivered the dessert [SW]
chef0 (pid 43622) is waiting for Walnuts and Sugar [SW]
the wholesaler (pid 43621) has obtained the dessert and left
the wholesaler (pid 43621) delivers Milk and Sugar
the wholesaler (pid 43621) is waiting for the dessert
chef5 (pid 43627) has taken the Sugar [MS]
chef5 (pid 43627) has taken the Milk [MS]
chef5 (pid 43627) is preparing the dessert [MS]
chef5 (pid 43627) has delivered the dessert [MS]
chef5 (pid 43627) is waiting for Sugar and Milk [MS]
the wholesaler (pid 43621) has obtained the dessert and left
chef0 (pid 43622) is exiting
chef2 (pid 43624) is exiting
chef4 (pid 43626) is exiting
chef3 (pid 43625) is exiting
chef5 (pid 43627) is exiting
chef1 (pid 43623) is exiting
the wholesaler (pid 43621) is done (total deserts: 5)
```

## hw3named program results

```
1 WS
2 FM
3 SM
4 SW
5 MS|
```

*input file*